Idaho National Laboratory
Nuclear Nonproliferation Division

Nuclear Nonproliferation Division
- Modeling and Simulation -

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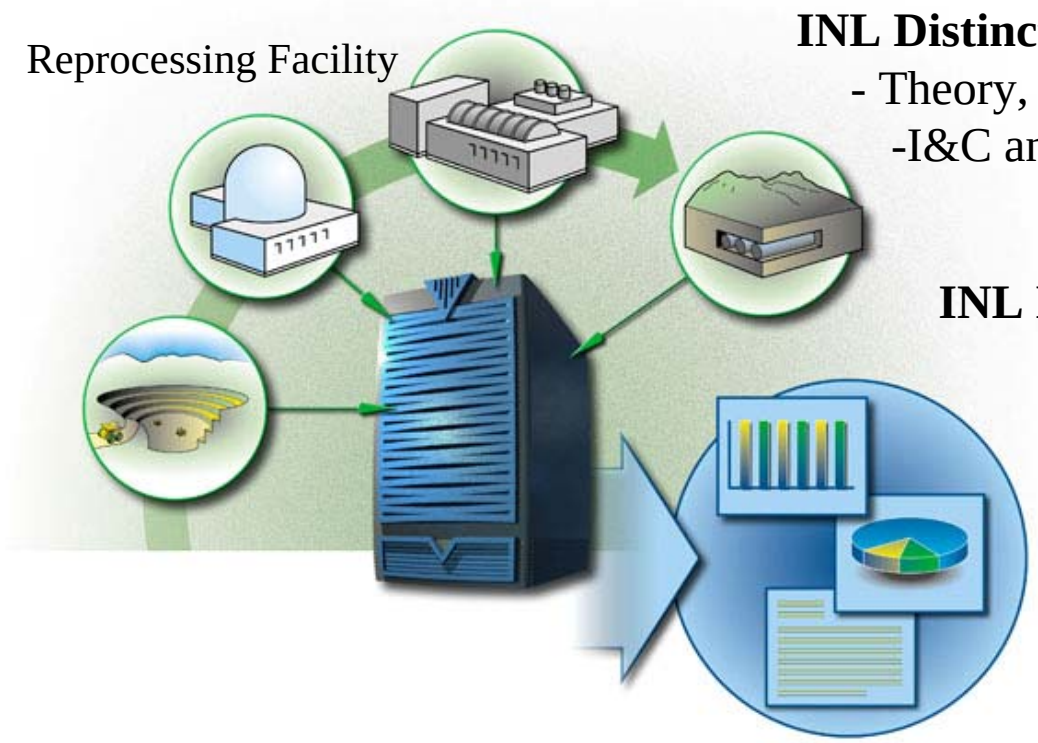
Lead, Programs for
Nuclear Energy Nonproliferation and Safeguards

Enhancing Nonproliferation, Safeguards and Security Through Modeling and Simulation



INL Distinctive Scientific Signatures:
- Theory, Modeling and Simulation
-I&C and Intelligent Systems

+

INL Nuclear Energy Systems

+

INL Strengths in Safeguards and Physical Security

=

State of the Art Models for 'Simulation Based Design'

- SESAME -

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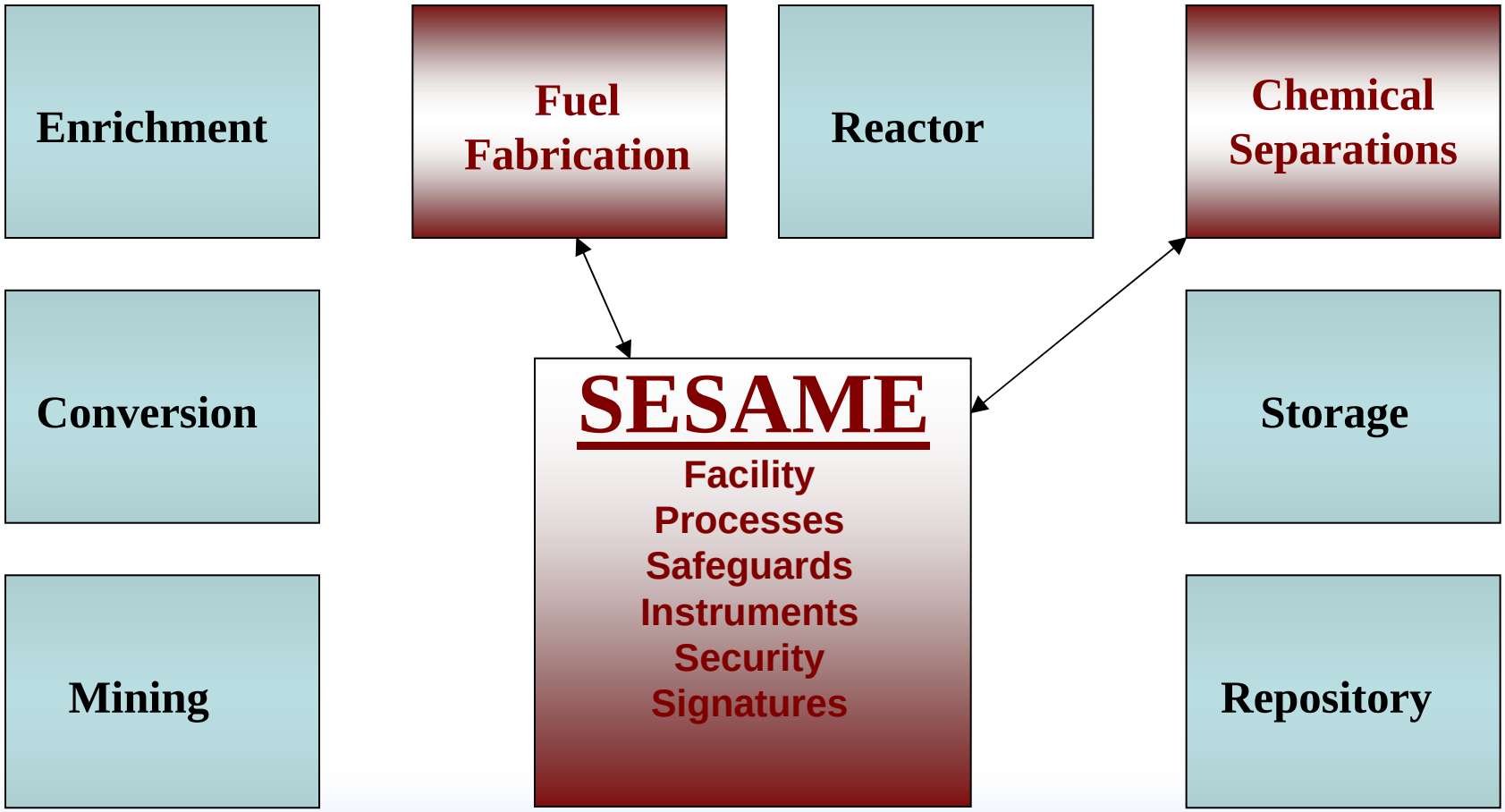
SESAME

Simulation Enabled Safeguards Assessment MEthodology



First Principles Models

A ‘Scene’ from the SESAME Prototype (UREX+3)

Example Models:

Facility Architecture

Nuclear Material Acct.

Material Tracking

Safeguards - MBA/KMP’s

Physical Security Sys.

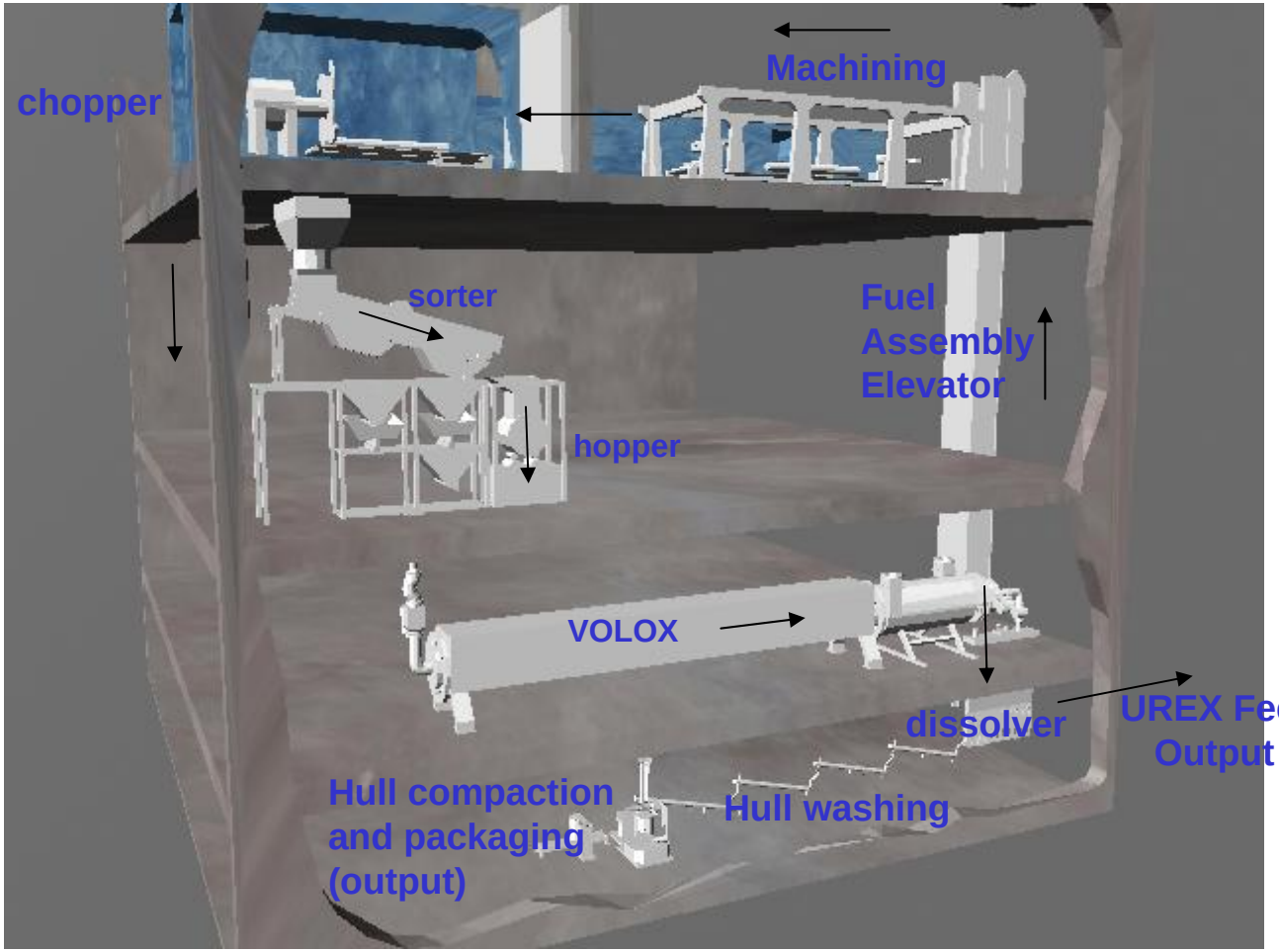
Containment and Surv.

Sensors and Controls

Radiation Fields

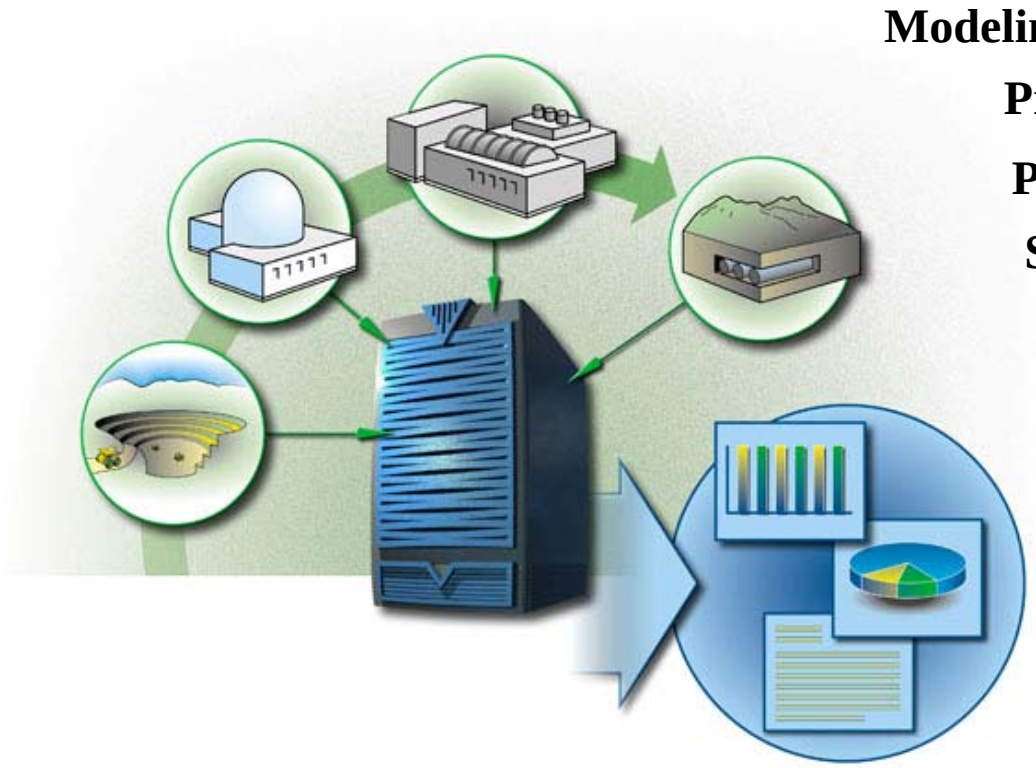
Process Engineering

…
…
…



‘Everything Safeguards Related (no Biology)’

‘Transformational’ Safeguards



Advances in Information Technology

Instrumentation and Controls

Modeling and Simulation

Process Monitoring

Physical Protection

Safeguards System

Cyber-Security

SCADA

+

Systems Integration

+

Modern Decision Tools

=

Intelligent Monitoring and Control System(s)

‘TIMC’

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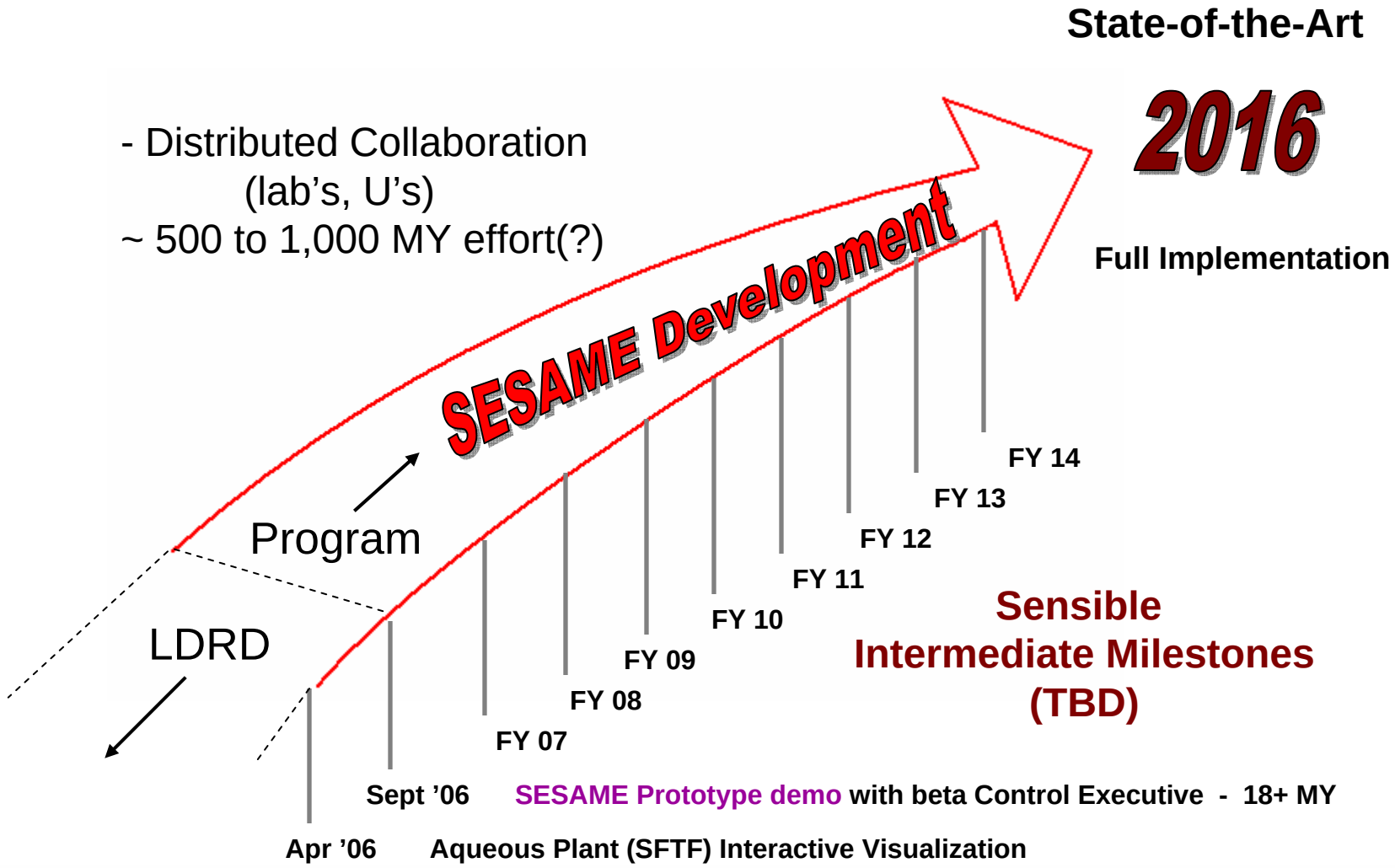
State-of-the-Art
2016
- Distributed Collaboration
(lab's, U's)
~ 500 to 1,000 MY effort(?)
SESAME Development
Full Implementation
Program
LDRD
FY 14
FY 13
FY 12
FY 11
FY 10
FY 09
FY 08
FY 07
Sensible
Intermediate Milestones
(TBD)
Sept '06 SESAME Prototype demo with beta Control Executive - 18+ MY
Apr '06 Aqueous Plant (SFTF) Interactive Visualization

SESAME - Some Considerations

(Rokkasho Reprocessing Plant: ~ $30+ Billion)

- **Development Program: ~$4 to $20 M/yr. ~10 Years.**
- ***'Distributed Collaboration'* (Use the Best, wherever …)**
  - **Laboratories, Universities. % at INL ?**
- **Computing Power: "State of the Art in 2016"**
- **Software Engineering Resources: ~'A Few Good Men'**
  - **Ratio Software Engineers to SME's ?**
- **Other Applications. Spin-off's?**
  - **Training, Design, Signatures, Virtual Experiments**
  - **Other: Use your imagination ☺**